526 Rec'd PCT/PTO 09 NOV 2000

(1390 REV. 5-93) US DEPT. OF COMMERCE PATENT & TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 107775
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (if known, sec 37 C.F.R.1.5) 09/700023
INTERNATIONAL APPLICATION NO. PCT/NL99/00303	INTERNATIONAL FILING DATE May 18, 1999	PRIORITY DATE CLAIMED May 18, 1998

TITLE OF INVENTION
SCREW ACTUATOR, AND BRAKE CALLIPER COMPRISING SUCH ACTUATOR

APPLICANT(S) FOR DO/EO/US
Armin Herbert Emil August OLSCHEWSKI, Hendrikus Jan KAPAAN, Clair DRUET, Thomas Wilhelm FUCKS, Jacobus ZWARTS, Johannes Albertus WINDEN VAN, Andries Christian RINSMA, and Jiri GURKA

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.

2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.

3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).

4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)

6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. ☒ The English language International Preliminary Examination Report has been transmitted by the International Bureau under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. ☒ A FIRST preliminary amendment.

    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☐ Entitlement to small entity status is hereby asserted.

16. ☒ Other items or information: Notification of the Recording of A Change

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U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) 09/700023	INTERNATIONAL APPLICATION NO. PCT/NL99/00303	ATTORNEY'S DOCKET NUMBER 107775

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National fee (37 CFR 1.492(a)(1)-(5)):		
Search Report has been prepared by the EPO or JPO $860.00		
International preliminary examination fee paid to USPTO (37 CFR1.482) $690.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $710.00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....$1,000.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....$ 100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$860	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	34 - 20 =	14	X $ 18.00	$252	
Independent Claims	1 - 3 =	0	X $ 80.00	$	
Multiple dependent claim(s)(if applicable)			+ $270.00	$	
			TOTAL OF ABOVE CALCULATIONS =	$1,112	
Reduction by 1/2 for filing by small entity, if applicable.			-	$	
			SUBTOTAL =	$1,112	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 month from the earliest claimed priority date (37 CFR 1.492(f)).			+	$	
			TOTAL NATIONAL FEE =	$1,112	
			Amount to be refunded	$	
			Charged	$	

a. ☒ Check No. 113560 in the amount of $1,112 to cover the above fees is enclosed.
b. ☐ Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.
c. ☒ The Director is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 15-0461. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
OLIFF & BERRIDGE, PLC
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NAME: James A. Oliff
REGISTRATION NUMBER: 27,075

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REGISTRATION NUMBER: 30,411

(1390 Rev.10-00)

U.S. APPLICATION NO (if known, see 37 C.F.R. 1.5) 09/700023	INTERNATIONAL APPLICATION NO. PCT/NL99/00303	ATTORNEY'S DOCKET NUMBER 107775

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO ....$860.00 International preliminary examination fee paid to USPTO (37 CFR1.482) .....$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) .....$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....$1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....$ 100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$860	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

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Multiple dependent claim(s)(if applicable)			+ $270.00	$	
			TOTAL OF ABOVE CALCULATIONS =	$1,112	
Reduction by 1/2 for filing by small entity, if applicable.			-	$	
			SUBTOTAL =	$1,112	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 month from the earliest claimed priority date (37 CFR 1.492(f)).			+	$	
			TOTAL NATIONAL FEE =	$1,112	
			Amount to be refunded		$
			Charged		$

a. ☒ Check No. 113560 in the amount of $1,112 to cover the above fees is enclosed.
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REGISTRATION NUMBER: 30,411

(1390 Rev.10-00)

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Armin Herbert Emil August OLSCHEWSKI, Hendrikus Jan KAPAAN, Clair DRUET, Thomas Wilhelm FUCKS, Jacobus ZWARTS, Johannes Albertus WINDEN VAN, Andries Christian RINSMA, and Jiri GURKA

Application No.: U.S. National Stage of PCT/NL99/00303

Filed: November 9, 2000 Docket No.: 107775

For: SCREW ACTUATOR, AND BRAKE CALLIPER COMPRISING SUCH ACTUATOR

PRELIMINARY AMENDMENT

Director of the U.S. Patent and Trademark Office
Washington, D. C. 20231

Sir:

Prior to initial examination and after entry of the annexes to the International Preliminary Examination Report, please amend the above-identified application as follows:

IN THE CLAIMS:

Please amend claims 4, 7-11, 15-16, 20-21, 24-31, and 34 as follows:

Claim 4, line 1, change "any of the preceding claims" to --claim 1--.

Claim 7, line 1, change "any of the preceding claims" to --claim 1--.

Claim 8, line 1, change "any of claims 1-6" to --claim 1--.

Claim 9, line 1, change "any of the preceding claims" to --claim 1--.

Claim 10, line 1, delete "and 9".

Claim 11, line 1, delete "and 9".

Claim 15, line 1, change "any of the preceding claims" to --claim 1--.

Claim 16, line 1, change "any of the preceding claims 4-15" to --claim 4--.

Claim 20, line 1, delete "and 19".

Claim 21, line 1, change "any of the preceding claims" to --claim 1--.

Claim 24, line 1, change "any of the preceding claims" to --claim 1--.

Claim 25, line 1, change "any of the preceding claims" to --claim 1--.

Claim 26, line 1, change "any of claims 1-24" to --claim 1--.

Claim 27, line 1, change "any of claims 1-24" to --claim 1--.

Claim 28, line 1, change "any of the preceding claims" to --claim 1--.

Claim 29, line 1, change "any of the preceding claims" to --claim 1--.

Claim 30, line 2, change "any of the preceding claims 1-29" to --claim 1--.

Claim 31, line 5, change "any of claims 1-29" to --claim 1--.

Claim 33, line 3, change "any of claims 1-29" to --claim 1--.

REMARKS

Claims 1-34 are pending. By this Preliminary Amendment, claims 4, 7-11, 15-16, 20-21, 24-31, and 34 are amended to eliminate multiple dependencies. Prompt and favorable examination on the merits is respectfully solicited.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

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Date: November 9, 2000

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Screw actuator, and brake calliper comprising such actuator

The invention is related to a screw actuator, comprising an actuating member and a screw mechanism having a screw, nut and rolling elements, one of which screw and nut is rotatably supported with respect to the housing and providing a linear movement of the actuating member with respect to the housing in response to a rotational movement of the motor, and a reduction gear means.

Such screw actuator is known from ~~WO-A-9603301~~ GB-A-2291949. Said known screw actuator comprises a screw mechanism which is supported with respect to the housing by means of a bearing capable of accommodating axial and/or radial loads, e.g. an axial thrust bearing for accommodating the axial forces exerted on the brakepads.

This screw mechanism is a so-called roller screw mechanism. Depending on the application condition constraints i.e. space available, and load, one can select a roller screw or a ball screw type actuator. Specific application considerations for a roller screw is that such roller screw mechanism provides a high power density, which means that within specific dimensional constraints, a relatively high load carrying capacity can be provided. Said carrying capacity however is predominantly related to axial loads. With respect to radial loads, the carrying capacity is less favourable compared to a ball screw. A roller screw mechanism is in general more sensitive with respect to radial loads and misalignment.

Another specific component in a roller screw mechanism is the cage which is necessary to space the rollers. In high speed applications this cage mass results in higher starting torques.

The object of the invention is to provide an improved actuator. This object is achieved in that the nut is fixed with respect to the housing, and the screw is rotatably supported with respect to the housing by means of the rolling elements. Said rolling elements may comprise rollers or balls.

In order to obtain about the same load bearing capacity as in a roller screw mechanism, the pitch diameter of the rolling balls, the ball diameter and its contact angle with screw and nut, and the number of turns should be designed such that appropriate dimensions and the required load carrying capacity are provided. However, as the rolling elements of the screw mechanism can also act as bearing elements for supporting the rotating screw, no separate bearing is necessary to take

up the axial load. As a result, the overall dimensions for a ball screw mechanism may remain limited in order to meet application requirements.

The ball screw mechanism is less sensitive with respect to radial loads, which makes it less vulnerable for misalignments. Also, no cage is needed for recirculation of the balls. Instead, recirculation of the balls may be obtained by means of recirculation tube or hole plug between the first and the last ball row or for each ball turn.

The axial moving and rotating screw according to the invention may be driven by the reduction gear means through a coupling means which allows axial displacements. Said coupling means may comprise a drive shaft accommodated within a bore in the screw, the surface of the drive shaft and the bore having axial grooves which engage each other through balls or splines.

The screw may engage the actuating member through a bearing capable to cope with radial and axial load in order to stop the rotating motion in relation to the moving actuating member.

The reduction gear means is preferably contained in a reduction gear module and the screw mechanism is contained in a screw mechanism module.

The actuating member may be executed as a piston, which is slidably held within a cylinder space of the housing. Said piston can be held non-rotatably by means of a groove and pin assembly. The motor drive module can be mounted in-line with the actuator or in angled position.

For a right angle position of the motor module, the reduction gear means may comprise one or more reduction steps with at least part of a planetary gear system having a stationary outer ring gear wheel with inwardly pointing gear teeth. In particular, the reduction gear means may comprise satellite gear wheels which mesh with the ring gear wheel and which are accommodated on a carrier connected to a rotary shaft engaging the screw mechanism, and the sun gear wheel of the planetary gear system may be accommodated on a drive shaft of the drive module. This system provides an optimal axial compactness of the application.

The sun gear wheel of the reduction gear means is connected to an angled or right angle gear reduction e.g. a bevel gear which mates with a motor driven bevel pinion. Said sun gear wheel and the bevel gear are carried out as a unitary gear wheel which is supported with respect to the nut of the screw mechanism by means

of a rolling element bearing. In order to achieve an appropriate reduction, the pitch diameter of the bevel gear is larger than the pitch diameter of the sun gear wheel.

Furthermore, a sensor fixed on a bearing or near the motorshaft may be provided for detecting rotational and/or translational movements of the screw mechanism or other operating parameters. Also, control means may be provided, said control means having an input for a control signal, e.g. from a brake pedal, and being connected to the sensor for controlling the electric motor on the basis of the control signal and the signal from the sensor. The sensor is in particular suitable for obtaining force feedback, wear compensation and/or maintenance indication.

The actuator according to the invention can be applied for different purposes. In particular, the actuator is suitable for use in a brake calliper for an electrically actuatable disc brake, said calliper comprising an actuator as described before, and a claw piece carrying two opposite brake pads, said actuator comprising a screw and a nut one of which is rotatably supported with respect to the housing by means of an angular bearing, and a reduction gear means.

The invention will further be described with reference to the embodiments of figures 1 and 2.

Figure 1 shows a brake calliper, comprising an actuator according to the invention, in exploded view.

Figure 2 shows the brake calliper according to figure 1, in assembled state.

Figure 3 shows a detail.

Figure 4 shows a detail of the ball screw.

~~Figure 5 shows a further embodiment.~~

The brake calliper shown in figures 1 and 2 comprises a claw piece 1 carrying a fixed brake pad 2 and a displaceable brake pad 3. Said brake pads 2, 3 can be brought into co-operation with brake disc 4.

The displaceable brake pad 3 engages a ball screw mechanism 5 which by means of reduction gear means 6 is driven by motor 7. Said motor 7 may be provided with a sensor 40, connected to the motor shaft.

More in particular, the displaceable brake pad 3 is connected by means of bolt 8 and screwthreaded hole 9 to an actuating member 10. Said actuating member 10 engages the screw 11 by means of a bearing 12 capable to take up axial load. Said

actuating member is carried out as a piston 10, which is slidably, but non-rotatably held in a cylinder space 38 in the housing 17.

By means of balls 13, screw 11 engages the nut 14. Said nut 14 has an external screwthread 15, by means of which the nut 14 is connected to the housing 17. Moreover, a recirculating tube 18 for recirculating the balls 13 upon rotating the screw 11 with respect to said nut 14, extends through the nut.

The screw 11 has a bore 37 with internal grooves 19, which engage balls 20. Said balls 20 also engage the external grooves 21 of drive shaft 22.

By rotating drive shaft 22 through reduction gear means 6 and motor 7, the screw 11 is rotated as well. As a result, it is displaced backward or forward by the co-operation of its screw type groove 23 with the screw type groove 24 of the nut 14, by means of the balls ~~15~~ 13.

Drive shaft ~~23~~ 22 is connected to a carrier 25, which carries satellite gear wheels 26. Said satellite gear wheels 26 each engage a ring gear wheel 27 as well as a sun gear wheel 28.

Sun gear wheel 28 forms a unity with bevel gear 29 which together form a unitary gear wheel 30. Said unitary gear wheel 30 by means of bearing 31 is supported with respect to the nut 14.

The bevel gear 29 engages the bevel pinion ~~31~~ 32, which in turn is driven by motor 7.

The bearing 31, which supports the unitary gear wheel with respect to the nut 14, comprises a sensor 33 for detecting the rotations of the screw mechanism, and thereby the displacement of the displaceable brake pad 3.

Housing 17 comprises a bore 34, through which a wire can be guided to the outside from said sensor 33.

The carrier 25 is supported with respect to the housing 17 by means of bearing 35; by means of bolts 36, motor 7 is connected to said housing 17.

According to the detail of figure 3, the connection between brake pad 3 and piston 10 may alternatively be obtained through edges ~~43~~ which are slidable mounted in grooves 43 of piston 10.

In order to accommodate the axial forces exerted on the ball screw mechanism when applying a brake force on the brake pads 2,3, the screw threads 23, 24 of screw 11 respectively nut 14 can be adapted according to the embodiment shown in figure

4. In cross-section, the threads 23 have raised parts 51, whereas the threads 24 have raised parts 52.

As a result of these shapes, the working lines 50 as defined by the contact angles and the ball conformity with the ball tracks, which define the load paths which play a role in force transfer, are in a more inclined position. The contact angle is between 45-70° in order to create optimized load carrying capacity for the ball screw in relation to the applied load specification.

The embodiment of figure 5 comprises a motor 61, having a stator 53 and a rotor 54 connected to a sleeve 55. The sleeve 55 is connected through the intermediate piece 56 to drive shaft 22. Alternatively, the sleeve 55 may be connected to the drive shaft 22 through a gear reduction.

Drive shaft 22 drives screw 11 of screw mechanism 5, through the groove 21, 19 in the respectively the drive shaft 22 and the screw 11, as well as through the balls 20 accommodated in said grooves 21, 19.

Via thrust bearing 69, the screw 11 can be connected to e.g. a brake pad in case of an actuator applied in a claw piece. The thrust bearing 69 comprises two rings 67, 68, and balls 12. One of the rings 67 may from a unity with the screw 11. The other ring 68 may comprise a locking groove 66 for locking a brake pad (not shown) thereto.

The screw 11 is rotatably and translatably held in a cylinder space 59 defined by insert ring 58 inserted in nut 14 of the screw mechanism 5. Nut 14 and screw 11 of screw mechanism 5 engage each other through balls 13, accommodated in respective screwthreaded threads of nut 14 and screw 11.

Sleeve 55 connected to rotor 54 of motor 61 is rotatably supported on the fixed nut 14 by means of bearings 63. These bearings have an outer race accommodated in the sleeve 55, and an inner ring 57 having appropriate raceways as well. The inner ring 57 is locked by means of locking ring 65. Furthermore, these bearings 63 have balls 64.

Alternatively, two separate standard ball or roller bearings may be applied.

The housing of the actuator is indicated by reference number 62.

Claims

1. Screw actuator, comprising a housing (17), a motor (7), an actuating member (10) and a screw mechanism (5) which provides a linear movement of the actuating member with respect to the housing in response to a rotational movement of the motor (7), which screw mechanism (5) comprises a screw (11), a nut (14) engaging each other by rolling elements (13), one of said screw (11) and nut (14) being rotatably supported with respect to the housing (17), and a reduction gear means (6), characterized in that the nut (14) is fixed with respect to the housing (17), and the screw (11) is rotatably supported with respect to the housing by means of the rolling elements (13).

2. Actuator according to claim 1, wherein the screw (11) is rotationally driven by the reduction gear means (6) through a coupling means (19-22) which allows axial displacements.

3. Actuator according to claim 2, wherein the coupling means comprises a shaft (22) accommodated within a bore (37) in the screw (11), the surface of the shaft (22) and bore having axial grooves (19, 21) which engage each other through balls (20).

4. Actuator according to any of the preceding claims, wherein the reduction gear means (6) is contained in a reduction gear module and the screw mechanism (5) is contained in a screw mechanism module.

5. Actuator according to claim 4, wherein the reduction gear means (6) comprises at least two gear reduction steps.

6. Actuator according to claim 6, wherein the reduction gear means comprises gear reduction steps of a different type, such as a planetary gear reduction step (25-28) and a right angle gear reduction step (28-31).

(65)

7. Actuator according to any of the preceding claims, wherein the screw (11) engages the actuating member (10) through a bearing (12) capable to carry axial and/or radial load.

8. Actuator according to any of claims 1-6, wherein the screw (11) is rigidly connected to the actuating member (10).

9. Actuator according to any of the preceding claims, wherein the actuating member is a piston (10), which is slidably held within a cylinder space (38, 59) of the housing (17).

10. Actuator according to claim 7 and 9, wherein the piston (10) is held non-rotatably by means of a groove and pin assembly, or by means of a ball/groove assembly.

11. Actuator according to claims 8 and 9, wherein the piston (10) is rotatably held within the cylinder space (38).

12. Actuator according to claim 9, wherein the cylinder space (59) is formed in the nut (14).

13. Actuator according to claim 4, wherein the modules are axially aligned.

14. Actuator according to claim 4, wherein the modules are in ~~laterally shifted~~ positions, which are laterally shifted with respect to the axis of the screw mechanism (5).

15. Actuator according to any of the preceding claims, wherein one or two ~~laterally shifted~~ motors are provided, which are laterally shifted with respect to the axis of the screw mechanism (5).

16. Actuator according any of the preceding claims 4-15, wherein the reduction gear means (6) comprises at least part of a planetary gear system having a stationary outer ring gear (27) with inwardly pointing gear teeth.

17. Actuator according to claim 16, wherein the reduction gear means comprises satellite gear wheels (26) which mesh with the ring gear (27) and which are accommodated on a carrier (25) connected to the shaft (22) engaging the screw mechanism (15).

18. Actuator according to claim 17, wherein the sun gear wheel (28) of the reduction gear means (6) is connected to a bevel gear (29) which mates with a motor gear, e.g. an angled or right angled gear transmission (32).

19. Actuator according to claim 18, wherein the sun gear wheel (28) and the bevel gear (29) are carried out as a unitary gear wheel (30) which is supported with respect to the nut (14) of the screw mechanism (5) by means of a rolling element bearing (31).

20. Actuator according to claim 18 or 19, wherein the pitch diameter of the bevel gear (29) is larger than the pitch diameter of the sun gear wheel (28).

21. Actuator according to any of the preceding claims, wherein a sensor (33) is provided for detecting rotational and/or translational movements of the screw mechanism (5).

22. Actuator according to claim 21, wherein control means are provided, said control means having an input for a control signal, e.g. from a brake pedal, and being connected to the sensor (33) for controlling the electric motor (7) on the basis of the control signal and the signal from the sensor (33).

23. Actuator according to claim 22, wherein the control device is arranged for providing a maintenance indication signal.

24. Actuator according to any of the preceding claims, wherein balls or rollers (13) of the screw mechanism (5) are coated so as to maintain the proper function of the screw (11) under dry-running conditions such as a diamond-like carbon coating.

25. Actuator according to any of the preceding claims, wherein the motor (7) is an electric motor.

26. Actuator according to any of claims 1-24, wherein the motor (7) is a hydraulic motor.

27. Actuator according to any of claims 1-24, wherein the motor (7) is a pneumatic motor.

28. Actuator according to any of the preceding claims, wherein at least one of the screw, nut, rolling elements and/or reduction gear components is obtained by hard turning.

29. Actuator according to any of the preceding claims, wherein the screw mechanism comprises rolling balls, and the grooves in the screw and nut are arranged for adapted contact angles in view of improved axial load bearing capacity.

30. Reduction gear module for use in the actuator according to any of claims 2-27.

31. Screw mechanism module for use in the actuator according to any of claims 2-27.

32. Drive module for use in the actuator according to any of claims 2-29.

30

33. Brake calliper for an electrically actuatable disc brake, said calliper comprising an actuator according to any of the preceding claims 1-29, and a claw piece (1) carrying two opposite brake pads (2, 3), said actuator comprising a screw mechanism (5) the screw (11) of which is rotatably supported with respect to the housing (17) by means of the balls (23) of the screw mechanism (5), a reduction gear means (6) and a motor (7).

31

~~34~~. Continuously variable transmission comprising two pulleys which each have two discs enclosing a V-shaped groove, as well as a belt engaging said grooves, the discs of each pulley being movable towards and away from each other so as to continually change the running radius of the belt, wherein the discs of each pulley are displaceable by means of an actuator according to any of claims 1-29.

32 31

~~35~~. Continuously variable transmission according to claim ~~34~~, wherein the drive of the discs comprises hydraulic means.

33 31

~~36~~. Continuously variable transmission according to claim ~~34~~, wherein the drive of the discs comprises mechanical means.

34

~~37~~. Clutch, comprising two clutch plates which can be brought into frictional engagement for transferring a drive couple, said clutch plates being connected to (an input shaft and to an output shaft) ~~the shaft~~, comprising an actuator according to any of claims 1-29, said actuator having a hollow screw which accommodates one of the shafts.

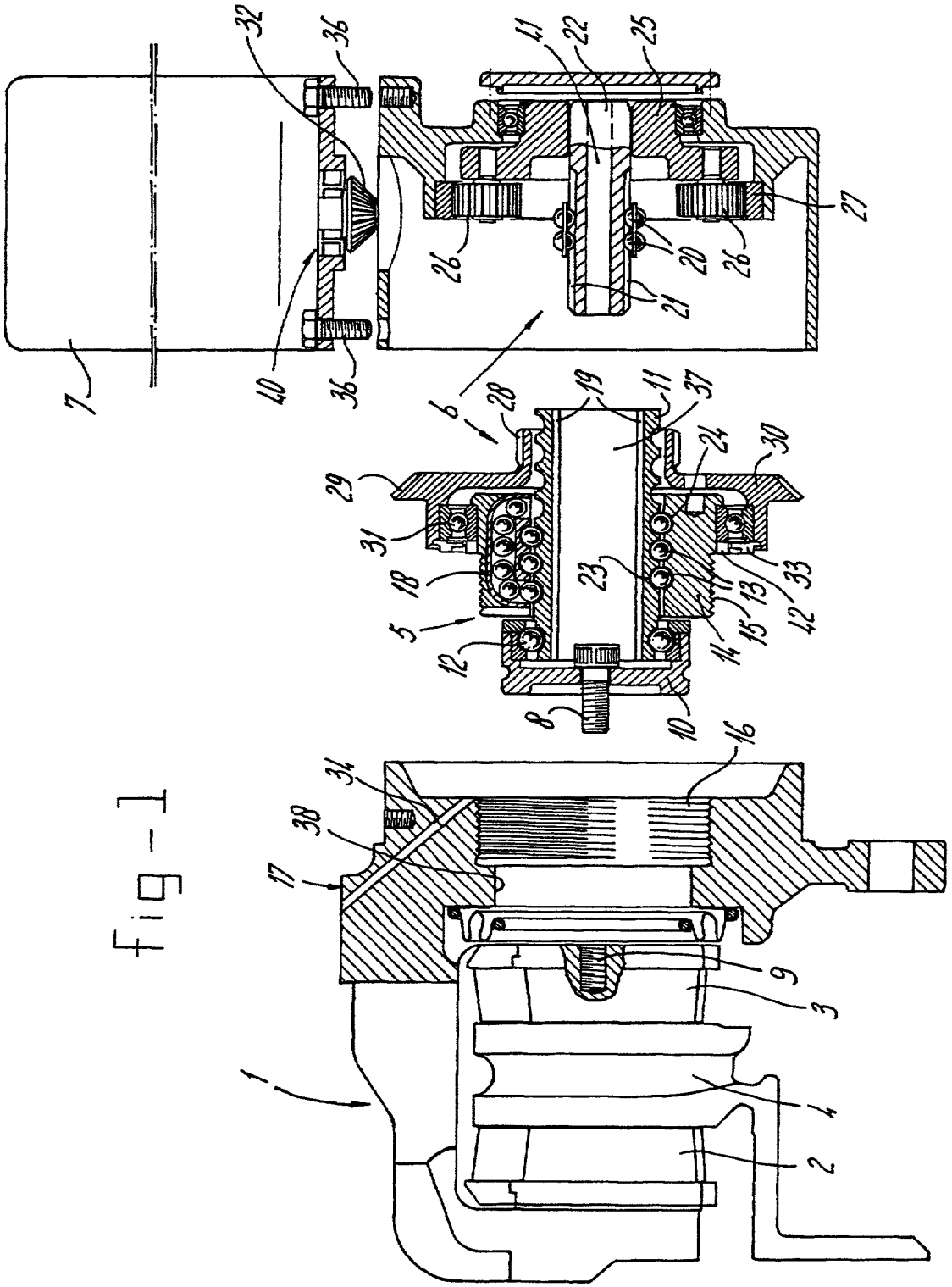


Fig - 1

Fig-2

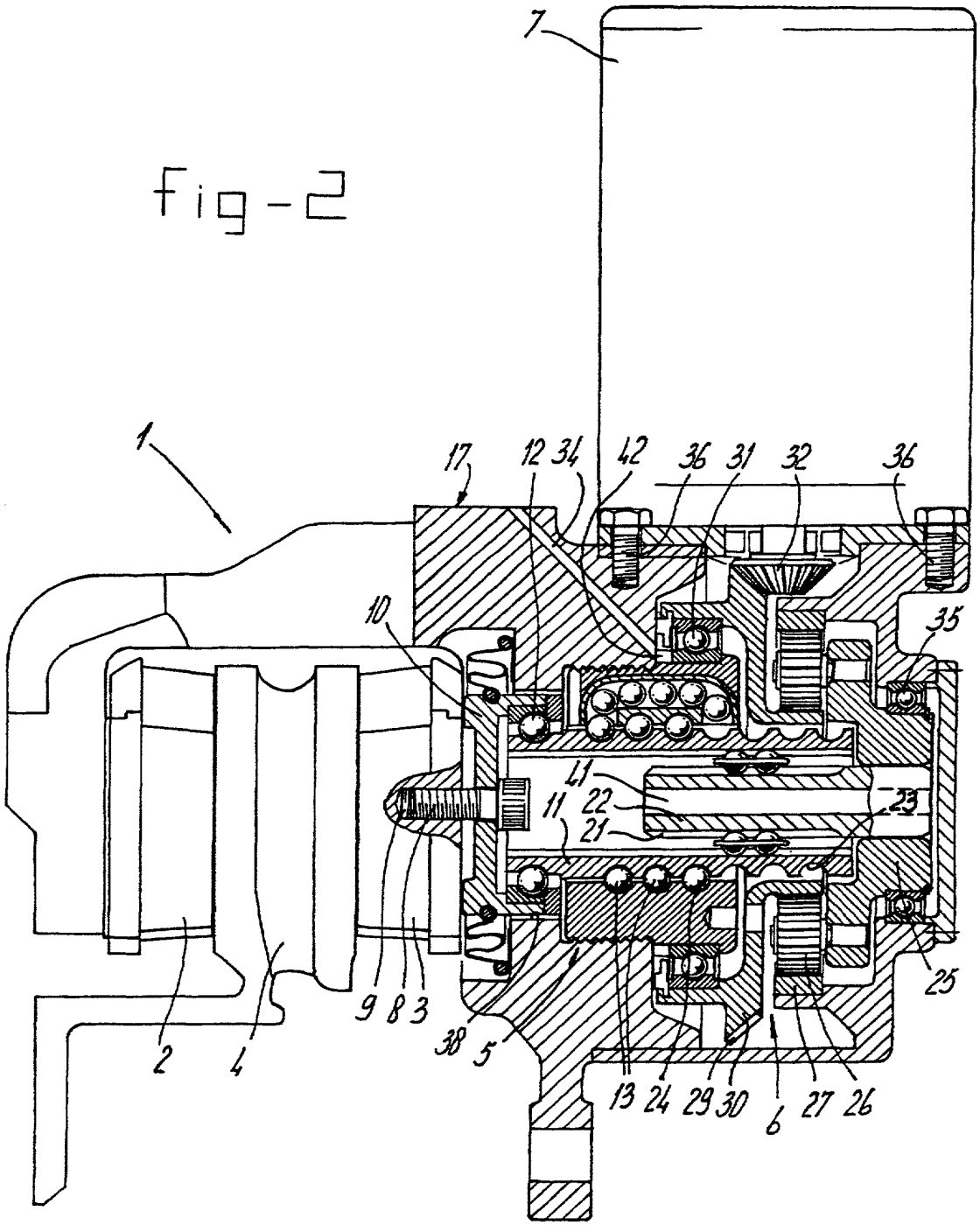


Fig-3

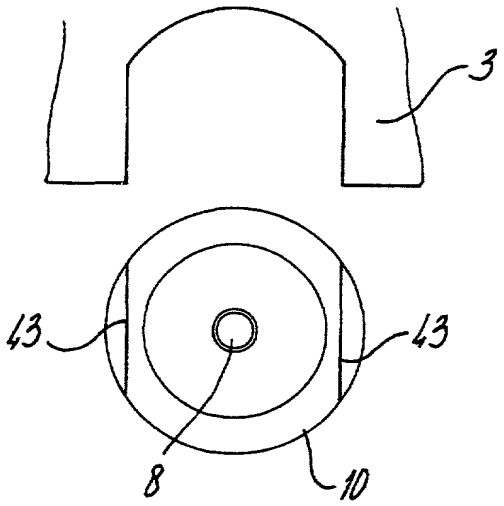
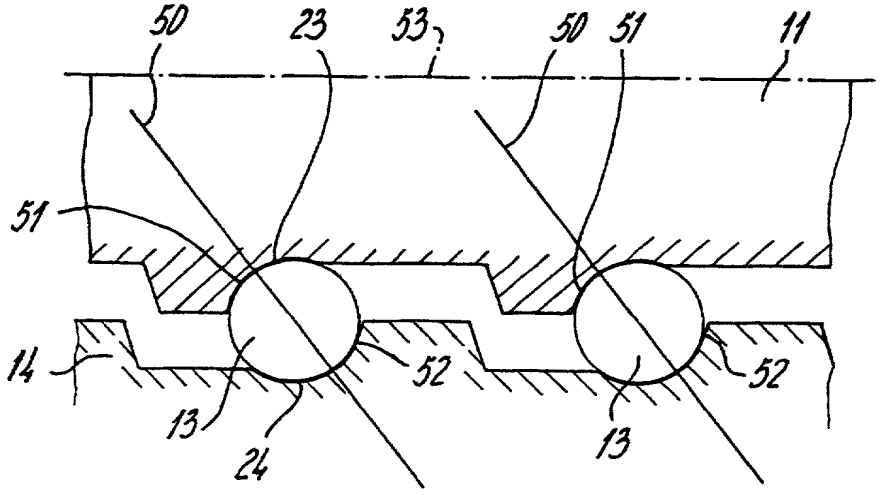


Fig-4



AMENDED SHEET

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL DESIGN, NATIONAL STAGE OF PCT OR CIP APPLICATION)

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Screw actuator, and brake calliper comprising such actuator

the specification of which: (complete (a), (b) or (c) for type of application)

REGULAR OR DESIGN APPLICATION

a. [ ] is attached hereto.

b. [ ] was filed on as Application
Serial No. and was amended on
(if applicable)

PCT FILED APPLICATION ENTERING NATIONAL STAGE

c. [X] was described and claimed in International application No. PCT/NL99/00303
filed on 18 May 1999
and as amended on (if any)

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, paragraph 1.56(a).

In compliance with this duty there is attached an information disclosure statement 37 CFR 1.97

PRIORITY CLAIM

I hereby claim foreign priority benefits under Title 35, United States Code paragraph 119 of any foreign application (s) for patent of inventor's certificate listed below and have also identified below any foreign application for patent of inventor's certificate having a filing date before that of the application on which priority is claimed.

(complete (d) or (e))

d. [ ] no such applications have been filed
e. [X] such applications have been filed as follows

EARLIEST FOREIGN APPLICATION(S), IF ANY FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION

Country	Application Number	Date of filing (day, month, year)	Date of Issue (day, month, year)	Priority claimed
the Netherlands	1009197	18 May 1998		Yes

ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION

_____

_____

CONTINUATION-IN-PART

(Complete this part only if this is a continuation-in-part application)

I hereby declare claim the benefit under Title 35, United States code, paragraph 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claim of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, paragraph 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, paragraph 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____

(Application Serial No.) (Filing date) (Status) (patented, pending, abandoned)

_____

(Application Serial No.) (Filing date) (Status) (patented, pending, abandoned)

POWER OF ATTORNEY

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The undersigned, the above-noted Applicants, hereby revoke all previous powers of attorney and appoint the following as attorneys of record with full power of substitution and revocation to prosecute this patent application and all continuations and divisions thereof, and to transact all business in the Patent and Trademark Office:

James A. Oliff, Registration No. 27,075;
William P. Berridge, Registration No. 30,024;
Kirk M. Hudson, Registration No. 27,562;
Thomas J. Pardini, Registration No. 30,411; and
Edward P. Walker, Registration No. 31,4500.

ALL CORRESPONDENCE IN CONNECTION WITH APPLICATION SHOULD BE SENT TO OLIFF & BERRIDGE, P.O. BOX 19928, ALEXANDRIA, VIRGINIA 22320, TELEPHONE: (703) 836-6400.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

1 - 0

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Inventor's signature

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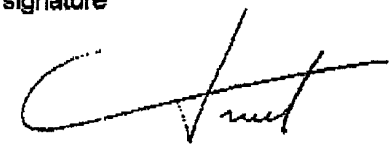
3 - 0

Full name of third inventor: **DRUET, Clair**
Inventor's signature



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Full name of sixth inventor: **VAN WINDEN, Johannes Albertus**
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Full name of seventh inventor: **RINSMA, Andries Christian**
Inventor's signature

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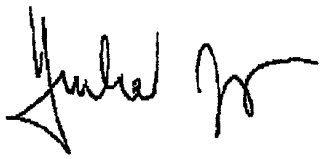
8-00

Full name of eight inventor: **GURKA, Jiri**
Inventor's signature



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CHECK PROPER BOX(ES) FOR ANY ADDED PAGE(S) FORMING A PART OF THIS DECLARATION.